

## Claims

1. A fluid ejection device, comprising:  
a substrate carrier having a substrate-receiving-surface;  
5 a substrate having at least one fluid ejector actuator disposed on said substrate; and  
a one-part epoxy adhesive disposed between said substrate and said substrate-receiving-surface, wherein said one-part adhesive comprises:  
an epoxy resin having a polyglycidyl ether of a polyhydric phenol,  
10 and  
a solid cycloaliphatic amine curing agent.
2. The fluid ejection device in accordance with claim 1, wherein said one-part epoxy adhesive further comprises a liquid aromatic amine curing  
15 agent.
3. The fluid ejection device in accordance with claim 1, further comprising at least one nozzle proximate to said at least one fluid ejector actuator disposed over said substrate.  
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4. The fluid ejection device in accordance with claim 1, wherein activation of said fluid ejector actuator ejects essentially a drop of a fluid from said at least one nozzle, wherein the volume of the fluid, of essentially said drop, is in the range of from about 5 femto-liters to about 900 pico-liters.  
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5. The fluid ejection device in accordance with claim 4, wherein said fluid ejector actuator is a thermal resistor.
6. The fluid ejection device in accordance with claim 4, wherein said  
30 fluid ejector actuator is a piezoelectric actuator.
7. The fluid ejection device in accordance with claim 4, wherein

said fluid ejector actuator is a acoustic actuator.

5        8.        The fluid ejection device in accordance with claim 1, further comprising a reservoir fluidically coupled to said at least one fluid ejector actuator.

9.        The fluid ejection device in accordance with claim 1, further comprising a fluid definition layer.

10        10.        The fluid ejection device in accordance with claim 9, wherein said fluid definition layer further comprises:  
a chamber layer defining sidewalls of a chamber; and  
an orifice layer defining a bore.

15        11.        The fluid ejection device in accordance with claim 10, further comprising fluid inlet channels formed in said substrate and fluidically coupled to said chamber.

20        12.        The fluid ejection device in accordance with claim 1, further comprising a device body coupled to said substrate carrier.

25        13.        The fluid ejection device in accordance with claim 12, wherein said one-part epoxy adhesive forms an adhesive bond between said device body and said substrate carrier.

14.        The fluid ejection device in accordance with claim 1, wherein said substrate carrier further comprises a ceramic chip carrier.

30        15.        The fluid ejection device in accordance with claim 1, further comprising a reservoir fluidically coupled to said substrate.

16. The fluid ejection device in accordance with claim 1, wherein said fluid reservoir contains an ejectable fluid fluidically coupled to at least one nozzle.

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17. The fluid ejection device in accordance with claim 1, further comprising:

at least one active device disposed on said substrate; and

an electrical trace electrically coupling said at least one active device to said at least one fluid ejector actuator.

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18. The fluid ejection device in accordance with claim 17, wherein said active device further comprises a transistor.

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19. The fluid ejection device in accordance with claim 1, further comprising:

a substrate bond pad disposed on said substrate; and

an electrical interconnection electrically coupled to said substrate bond pad, wherein said one-part epoxy adhesive encapsulates said substrate bond pad and said electrical interconnection.

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20. The fluid ejection device in accordance with claim 1, further comprising a cover having a cover edge surface, and wherein said substrate further comprises a substrate edge surface, wherein said one-part epoxy adhesive forms a moat-fill adhesive structure in a volume formed between said substrate carrier, said substrate edge surface, and said cover edge surface.

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21. The fluid ejection device in accordance with claim 1, further comprising an electronic device electrically disposed on or within the fluid ejection device, wherein said one-part epoxy adhesive forms a glob top structure substantially encapsulating said electronic device.

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22. The fluid ejection device in accordance with claim 21, wherein said electronic device further comprises a memory device, said memory device is adapted to electrically couple to a controller, and said memory device having at least one parameter of an ejectable fluid wherein said at least one parameter is communicable to said controller.

23. The fluid ejection device in accordance with claim 22, wherein said memory device further comprises at least one parameter of the fluid ejection device is communicable to said controller.

24. The fluid ejection device in accordance with claim 1, further comprising:  
an electrical connector having:  
a body, and  
a connector electrical conductor; said electrical conductor electrically couples to a substrate carrier electrical conductor, wherein said one-part epoxy adhesive forms an underfill adhesive structure between said substrate carrier and said electrical connector.

25. The fluid ejection device in accordance with claim 24, further comprising a fluid ejection body portion, wherein said one-part epoxy adhesive forms an electrical connector attach adhesive structure between said fluid ejection body portion and said electrical connector.

26. The fluid ejection device in accordance with claim 1, wherein said polyglycidyl ether of a polyhydric phenol is a glycidyl ether of bisphenol A.

27. The fluid ejection device in accordance with claim 1, wherein said polyglycidyl ether of a polyhydric phenol is a glycidyl ether of bisphenol F.

28. The fluid ejection device in accordance with claim 1, wherein said

cylcoaliphatic polyamine is 3-aminomethyl-3,5,5-trimethyl-1-cyclohexylamine.

29. The fluid ejection device in accordance with claim 1, wherein said cylcoaliphatic polyamine is an epoxy modified cylcoaliphatic polyamine.

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30. The fluid ejection device in accordance with claim 1, wherein said epoxy resin further comprises a resin selected from the group consisting of a bisphenol type epoxy resin, an epoxy novolac resin, an epoxy phenolic novolac resin, a cresol glycidyl ether, a 1,4 cyclohexanedimenthanol diglycidyl ether, an aliphatic glycidyl ether having C8 to C18 alkyl groups, an alkyl glycidyl ether having C4 to C12 alkyl groups, a polypropylene glycol based resin, a 1,4 butanediol diglycidyl ether, triglycidylether of trimethylolpropane, 4-glycidoxy-N,N-diglycidyl aniline, halogenated phenoxy epoxy resins, epoxyalkoxy resins, and mixtures thereof.

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31. The fluid ejection device in accordance with claim 1, wherein said one-part epoxy adhesive further comprises a curing agent selected from the group consisting of 3-aminomethyl-3,5,5-trimethyl-1-cyclohexylamine, poly(oxypropylene diamine), poly(oxypropylene triamine), polyglycolamine, m-phenylene diamine, 4,4'-diaminodiphenyl sulfone, 4,4'-diaminodiphenyl methane, N-aminoethylpiperazine, 1,2-diaminocyclohexane, 1,3-diaminocyclohexane, 1,4-diamino-3,6-diethylcyclohexane, 2,2-di(4-aminocyclohexyl) propane, di(4-aminocyclohexyl) methane, boron trifluoride monoethylamine, boron trifluoride benzylamine, boron trifluoride amine complexes, hexahydrophthalic anhydride, polyazelaic polyanhydride, polyadipic polyanhydride, polysebacic polyanhydride, succinic anhydride, tetrahydrophthalic anhydride, low melting anhydrides, polyanhydrides, and mixtures thereof.

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32. The fluid ejection device in accordance with claim 1, wherein said one-part adhesive further comprises a thixotrope.

33. The fluid ejection device in accordance with claim 32, wherein said thixotrope is selected from the group consisting of fumed silicas, clays,  
5 nanoclays, talcs, calcium carbonates, and mixtures thereof.

34. The fluid ejection device in accordance with claim 1, wherein said one-part adhesive further comprises a silane coupling agent.

10 35. The fluid ejection device in accordance with claim 34, wherein said silane coupling agent is in the range from about 0.5 weight percent to about 1.5 weight percent.

36. The fluid ejection device in accordance with claim 34, wherein said  
15 silane coupling agent is less than 2.5 weight percent.

37. The fluid ejection device in accordance with claim 1, wherein said one-part adhesive further comprises a filler.

20 38. The fluid ejection device in accordance with claim 37, wherein said filler is selected from the group consisting of glass spheres, low density glass spheres, ceramic spheres, polymer spheres, barium sulfate, barium titanate, silicon oxide powder, amorphous silica, talc, clay, mica powder, and mixtures thereof.

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39. A fluid ejection device, comprising:  
a substrate having means for ejecting a fluid;  
means for supporting said substrate; and  
means for adhering said substrate to said means for supporting said  
30 substrate.

40. The fluid ejection device in accordance with claim 39, wherein said means for ejecting said fluid further comprises means for ejecting essentially a drop of said fluid, and the volume of said fluid is in the range of from about 5 femto-liters to about 900 pico-liters.

41. The fluid ejection device in accordance with claim 39, further comprising:  
10 means for forming a chamber; and  
means for forming a nozzle.

42. The fluid ejection device in accordance with claim 39, further comprising means for performing logic on said substrate.

15 43. A method of manufacturing a fluid ejection device, comprising:  
dispensing a one-part epoxy adhesive on a substrate or on a substrate receiving-surface of a substrate carrier, said substrate having at least one fluid ejector actuator disposed thereon, and said one-part epoxy adhesive  
20 comprises:

an epoxy resin having a polyglycidyl ether of a polyhydric phenol,  
and  
a solid cycloaliphatic amine curing agent;  
forming an adhesive bond structure between said substrate and  
25 substrate carrier; and  
curing said one-part epoxy adhesive.

44. The method of manufacturing in accordance with claim 43, wherein dispensing said one-part epoxy adhesive further comprises dispensing said one-part epoxy adhesive having a liquid aromatic amine curing agent.  
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45. The method of manufacturing in accordance with claim 43, further

comprising dispensing said one-part epoxy adhesive to encapsulate a substrate bond pad disposed on said substrate and an electrical interconnection electrically coupled to said substrate bond pad.

5           46.     The method of manufacturing in accordance with claim 43, further comprising dispensing said one-part epoxy adhesive forming a moat-fill adhesive structure in a volume formed between said substrate carrier, a substrate edge surface of said substrate, and a cover edge surface of a cover disposed on the fluid ejection device.

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          47.     The method of manufacturing in accordance with claim 43, further comprising dispensing said one-part epoxy adhesive forming a glob top structure substantially encapsulating an electronic device disposed on or within the fluid ejection device.

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          48.     The method of manufacturing in accordance with claim 43, further comprising dispensing said one-part epoxy adhesive forming an underfill adhesive structure between said substrate carrier and an electrical connector having:

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                  a body, and  
                  a connector electrical conductor.

          49.     The method of manufacturing in accordance with claim 48, further comprising dispensing said one-part epoxy adhesive forming an electrical  
25 connector attach adhesive structure between a fluid ejection body portion and said electrical connector.

          50.     The method of manufacturing in accordance with claim 48, further comprising dispensing said one-part adhesive forming an adhesive bond  
30 between said body and said substrate carrier.